Geophysical study of the crust and upper mantle in the Qinghai-Tibet Plateau. China: seismic reflection profiles in the central Tibet from 2004 to 2008

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The Qinghai-Tibet Plateau is considered as an optimal place for studying the basic problems of continental dynamics. Probing into the structure of the crust and upper mantle of the Qinghai-Tibet Plateau is a key to explaining continent-continent collision, and a necessary approach to understanding the forming and uplifting mechanism and geodynamic process of the plateau. Deep seismic reflection is the most effective method for studying the fine structure of the lithosphere. In this paper, we present seismic reflection data collected from 2004 to 2008 to investigate the crust and upper mantle of central Tibet. These data provide some important information about the crust and upper mantle of the central Tibetan Plateau.

1) Location of seismic reflection profiles

All these CMP profiles are located in the Qiangtang block. The section 1 is in the Xinglong-Ninghai area, and sections 5 and 6 span across the central uplift the Qiangtang block. Section 3 is located on the north wedge of the central uplift intersecting with section 4 (Figure 1).

2) Acquisition and processing

These six reflection lines lie with different geology and altitude conditions. Two lines (1 and 2) lie to the south Qiangtang block, two lines (3 and 4) lie to the central uplift of Qiangtang and others (5 and 6) lie to the north Qiangtang block. In order to get high-quality data, we tested different acquisition methods in field work. For example, we tested small, middle and large explosive source, tested super geophones and tested drilling machines. Main acquisition method are showed in table 1.

3) Reflection characters and primary conclusions

Some seismic image are showed in figure 6, figure 7 and figure 8. We can use these data to discover structural frame of the crust and upper mantle of the central Tibet. On the south part of the section 1 conducted in 2004, which lie near to Xinglong-Ninghai area, there are one group of strong reflection phase, dipping northward distinguishably from 7s to 10s TW (Figure 6a). On the stacked data of number 5 acquired in 2007 (Figure 6b), we also can find easily north dipping reflections in the lower crust of Qiangtang up to 20s. These reflections of lower crust can also be discovered on the section of number 6 in 2008 (Figure 6c). So many north dipping reflections appearing widely in the middle and lower crust of the Qiangtang block is very interesting and amazed for us. We think them as a result of the northern force during the collision between the India and Eurasia plates.

4) Future Work

A) Interpret these seismic sections
B) Test CMP technology on Tibet
C) acquire a long profile across Qiangtang block (SINOPROBE)

5) References


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